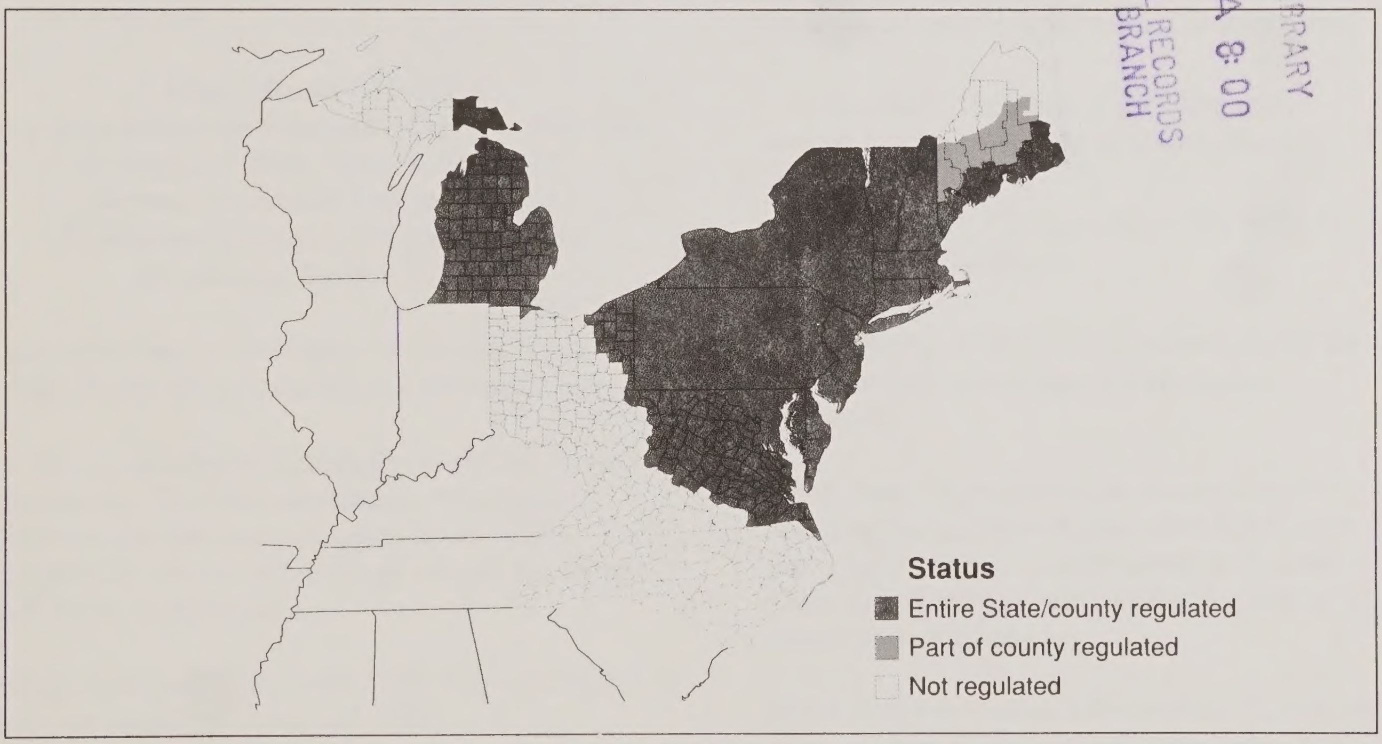
Gypsy Moth News

May 1995 Issue No. 38

Don't move the gypsy moth out of the infested area!

(see page 10)



Map provided by the USDA Animal and Plant Health Inspection Service.

In this issue:

FOREST SERVICE
DEPARTMENT OF AGRICULTURE

NORTHEASTERN AREA
State and Private Forestry

The Coupon

Gypsy Moth News -- Information Exchange Coupon

Use this coupon to:
- ☐ Request Information
- ☐ Make a Suggestion
- ☐ Ask a Question
- ☐ Add Name to Mailing List

Write your request, ask your question, or make your suggestion here:

____

____

____

____

____

____

____

____

Your Phone Number Here: ____________________

Mail this card or Fax: 304-285-1505

Please fill out the return address on the other side of this card.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1994—506-389

Name: ____
Company: ____
Address: ____
City, State, Zip: ____________________________________

Gypsy Moth News
c/o Forest Health Protection
USDA Forest Service
180 Canfield Street
Morgantown, WV 26505

Letters to the Editor

GPS

In the January '95 issue of ***Gypsy Moth News***, I was pleased to see a draft list of "WhoIs" experts associated with gypsy moth programs nationwide. Please add the following name to your list:

Nick Clemens, Wisconsin Department of Agriculture, Trade and Consumer Protection, Madison, WI 608-224-4585) clemens@wheel.datcp.state.wi.us

Nick's GPS experience includes the design and implementation of GPS in the 1994 Wisconsin aerial spray project, and development of GPS specifications for the 1995 aerial bid. Nick also developed guidelines to use hand-held GPS data loggers for the male moth and egg mass survey projects in 1995. He collaborates with many State and Federal GPS specialists to provide Wisconsin with the latest technological developments. I believe he can be a valuable asset to anyone interested in the potential use (and limitations) of GPS technology for gypsy moth survey and control projects. In addition, he is the Gypsy Moth GIS Coordinator for the State.

S.K., Madison, WI

Education

Just received the latest issue and saw WhoIs. There ought to be a place in there for Education/Extension/Outreach. Among other things, it would give people from different States who are working on the same thing a way to establish a network that is current. I know when I called you recently to see who was doing what in education, my contacts were out-of-date. *GM News* is a good forum for this and I hope you do WhoIs annually.

If you want to include me, you can try this:

Ten years experience developing educational programs/materials for pre-college schools; developed the Gypsy Moth in the Classroom project.

Erik Mollenhauer, Educational Information and Resource Center (EIRC), Sewell, New Jersey 609-582-7000 E-Mail: jeffmole@aol.com

E. M., Sewell, NJ

Editor's response to S.K. and E.M:

A complete WhoIs directory will be compiled this summer. If you would like to be included, send your name, affiliation, and area of expertise to me at 180 Canfield Street, Morgantown, WV 26505.

Feeding Preferences

Is there a strain of gypsy moth that prefers pine over hardwoods? Any information you can send me on research done in reference to the above question would be appreciated. Thank you.

S.B., Pocomoke City, MD

Michael Montgomery from the Northeastern Forest Experiment Station in Hamden, CT, responds:

When given a choice between pine and oak foliage, the gypsy moth always prefers to feed on oak foliage. Late instar larvae prefer pine for resting during the day and as a pupation and oviposition site. There is some evidence that this behavior of feeding on one host and pupating on another may help the gypsy moth escape predators and disease. The Asian strain of gypsy moth likely would have the same preference, but the young Asian gypsy moth larvae would survive better on pine foliage than the North American or European strain.

Degree Days

How many day-degrees are required to complete the life cycle of: a) the European Gypsy Moth and b) the Asian Gypsy Moth?

E. D., Nepean, Ontario, Canada

Melody Kenna from the USDA Forest Service in Hamden, CT and Jim Colbert from the USDA Forest Service in Morgantown, WV, respond:

There are many factors that affect the developmental rate of a given population of gypsy moths. These factors can be broken down into two groups: genetic and environmental. The speed of development dictated by the population's genes has been selected over time. The climate of the geographical area from which a population originates is critical and selects for individuals that will grow best in that area. For example, in the

laboratory, gypsy moths from Eastern Canada tend to grow faster than those from Connecticut and those from Bellyk in Siberian Russia grow faster than those from the Far East of Russia (see table). In both cases, the gypsy moths grow faster from climates where the growing season is shorter and temperatures are lower. The faster speed is, in part, due to a higher percentage of the females having only five instars instead of six.

Several environmental factors can alter the developmental rate of gypsy moths: temperature, humidity, food availability and quality, and maternal nutrition. Gypsy moths grow slightly ***faster*** *and pupate sooner when grown under crowded conditions than when grown individually in the laboratory. This is probably due to both competition for food and a slightly higher temperature in the container when crowded. Higher temperatures will result in faster development unless they are excessive. Available iron in the diets of both the maternal adults and offspring have been shown to be critical to normal development in the laboratory. If iron is not available the gypsy moth will develop slowly or not at all. In addition, if the female parent flies, the larvae that hatch from her eggs grow slower than those from other females that did not fly but were treated in the same way.*

Table 1. Accumulated day-degrees required by gypsy moth females to complete development when individually raised under constant temperature.

Source of Population	N	Mean	Std. Dev.	Min.	Max.
Lengarten, Germany[1]	223	941	70	814	1122
Siberian Russia	139	1019	61	836	1122
Siberian Russia	267	846	56	748	990
Far Eastern Russia	131	1036	59	880	1122
Far Eastern Russia[2]	169	857	85	792	1144
N.Carolina[2]	167	1006	56	836	1122
W.Virginia	99	1043	55	902	1144

[1] Hybridized population with approximately one-third of the females capable of sustained flight
[2] Collected before the introduction from Germany occurred.

The gypsy moth phenology prediction model, GMPHEN, uses data summarized from the literature and can be used to predict the eclosion, growth (instar transition or pupation), and emergence of male and female adults. Defaults for GMPHEN assume 885 degree-days for females and 860 degree-days for males to reach adulthood from eclosion. Eggs begin to hatch after 282 degree-days have been accumulated, starting January 1. Users can select between two degree-day calculation methods, change options and parameters, and choose output formats.

If you are interested in obtaining a copy of this DOS program, write to Jim Colbert, USDA Forest Service, 180 Canfield Street, Morgantown, WV 26505.

Eradication Projects are on the Increase Across the South[1]

As more people move out of the northeast in search of milder climates, more space, jobs, or areas to vacation, the number of isolated gypsy moth infestations has increased over time, at least in the South. Over the last 5 years, the number and size of eradication projects have increased throughout the South.

One concern is the size of some of the recent eradication projects. The larger infestations are generally located in remote areas, where detection trapping densities have historically been low. By the time delimiting grids define the boundary of these introductions, they are thousands of acres in size. It appears that the largest infestations are usually in the least populated portion of the State.

Arkansas treated over 25,000 acres in 1994 in a continuation of eradication project in the northern part of the State. This year, following an extensive trapping program, an additional 17,700 acres will be treated in areas surrounding the 1994 treatment area.

Tennessee treated approximately 7,000 acres in Grainger County in 1994. A follow-up trapping grid indicated that the treatment did not meet project objectives and the area will be retreated this year along with an additional 31,000 acres in surrounding lands, with a total of 37,700 acres. Tennessee will also be conducting five other eradication efforts in Unico (950 acres), Rhea (300 acres), Rutherford (360 acres), and Cocke (450 acres) Counties.

North Carolina has also experienced an increase in the number of locations that will require eradication projects. In 1995, North Carolina will conduct five eradication projects: Asheville area (1,500 acres), Boone (900 acres), Jefferson (800 acres), Todd (600 acres), and Marion (600 acres).

This year Georgia will treat about 1,750 acres in Fannin County. This follows a successful White County eradication project in 1992 and 1993 where approximately 7,200 acres were treated.

In addition to the introductions from the northeastern United States, the South is also continuing to deal with its first Asian introduction. In the southeastern portion of North Carolina, the State and APHIS will treat approximately 3,840 acres as a follow up to the Asian gypsy moth project that was initiated in 1994. Under the umbrella of the Asian project, South Carolina will be treating its first infestation in the nineties. An introduction from Fairfax County, Virginia, became established in Horry County, just south of the North Carolina border. Although the population does contain some Asian heritage, and is located close to the original introduction site, it is not likely that it resulted from introduction of Asian-European hybrids that occurred in 1993 in the vicinity of Wilmington, North Carolina. However, the South Carolina infestation falls within the delimiting zone of the Asian infestation and regulatory officials did not want to take any chances. Therefore, 2,500 acres will be treated by APHIS in conjunction with the North Carolina Asian gypsy moth eradication effort in 1995.

The number of eradication projects would have been far greater if not for the Slow-the-Spread pilot project (STS). STS plans to treat 22 blocks totaling 35,235 acres in North Carolina, Virginia and West Virginia. At least half of these blocks would have been treated as isolated infestations in the absence of the STS project.

As the generally infested area moves south, the number of isolated infestations will continue to increase. Some States are now intensifying trapping efforts in order to locate infestation sooner, and therefore, initiate eradication projects when the infestation is smaller.

[1]Written by John Ghent. John is an entomologist with the USDA Forest Service's Forest Health Staff in Asheville, NC.

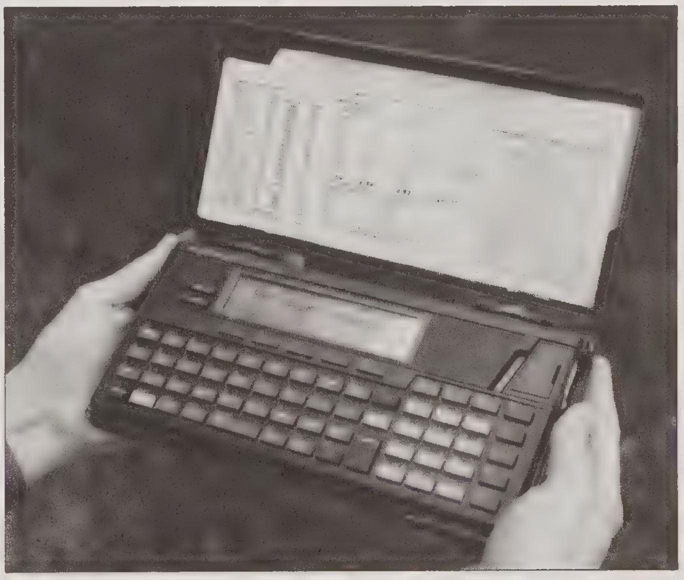
Proposed Gypsy Moth Suppression/Eradication Projects - 1995

Site	State	B.t.	Dimilin	Gypchek	Other	Total
GYPSY MOTH SUPPRESSION						
COOPERATIVE LANDS						
DE	DE	32752	7950	88	0	40790
MD	MD	40321	36158	0	0	76479
MI	MI	109304	0	0	0	109304
NJ	NJ	7865	0	0	0	7865
OH	OH	7300	0	0	0	7300
PA	PA	8565	0	0	0	8565
VA	VA	61923	72067	600	0	134590
WV	WV	2209	48260	113	0	50582
DEPARTMENT OF AGRICULTURE LANDS						
BELTSVILLE AGRICULTURAL RESEARCH CENTER	MD	308	0	0	0	308
DEPARTMENT OF DEFENSE LANDS						
INDIANHEAD NAVAL ORDNANCE STATION	MD	974	0	0	0	974
QUANTICO MARINE BASE	VA	1244	3515	0	0	4759
DEPARTMENT OF INTERIOR LANDS						
N. ZOOLOGICAL PARK	VA	343	0	0	0	343
SMITHSONIAN ENVIRONMENTAL EDUCATION CTR	MD	15	0	0	0	15
FISH & WILDLIFE SERVICE LANDS						
BLACKWATER NWF	MD	2683	0	0	0	2683
MASON NECK NWR	MD	250	0	0	0	250
INDIAN LANDS						
SENECA INDIAN NATION	NY	123	0	0	0	123
NATIONAL FOREST LANDS						
GEORGE WASHINGTON (VA&WV)	VW	3155	1515	130	0	4800
MONONGAHELA	WV	14298	0	982	0	15280
NATIONAL PARK SERVICE LANDS						
ARLINGTON NATIONAL CEMETERY	VA	400	0	0	0	400
BLUE RIDGE PARKWAY	VA	598	508	0	0	1106
FREDER/SPOTSYLVANA NB	VA	408	0	0	0	408
GREAT FALLS NP	VA	0	0	350	0	350
MANASSAS NBP	VA	275	0	0	0	275
PRINCE WILLIAM PARK	VA	589	0	0	0	589
SHENANDOAH NP	VA	0	307	0	0	307
GYPSY MOTH ERADICATION						
COOPERATIVE LANDS						
ASHE COUNTY (JEFF)	NC	800	0	0	0	800
BUNCOMBE COUNTY	NC	1500	0	0	0	1500
FANNIN COUNTY	GA	1754	0	0	0	1754
GRAINGER COUNTY	TN	37754	0	0	0	37754
PLUMLEE	AR	17697	0	0	0	17697
UNICOI COUNTY	TN	940	0	0	0	940
WATAUGA COUNTY	NC	800	0	0	0	800
WISCONSIN	WI	29145	0	0	960	30105
GYPSY MOTH SLOW THE SPREAD						
COOPERATIVE LANDS						
NCDA	NC	975	0	0	0	975
VA	VA	20578	0	0	1763	22341
WV	WV	8985	0	0	259	9244
NATIONAL FOREST LANDS						
JEFFERSON (VA&WV)	VW	1990	0	0	685	2675
	Grand Total:	**418820**	**170280**	**2263**	**3667**	**595030**

THE CALIBRATOR[1]

Recipient of the
1995 Chief's Award for Technology Transfer
and the
1995 Federal Laboratory Consortium for Technology Transfer Award

The **Calibrator** is a pocket-sized expert system developed for use in the field enabling anyone to perform error-free calculations needed to set and check aircraft spray systems. The system consists of a hand-held calculator with a removable microchip, a carrying case, a quick reference card, and a user handbook.



How it works

The **Calibrator** simplifies the process of calibration for the user. Complex formulas and large amounts of technical information are already stored in its microchip. The **Calibrator** guides the user through the calibration process by menu-driven screens and asks for necessary information as it is needed. Once the information is obtained, the **Calibrator** recommends initial settings for the spray equipment. If settings have to be adjusted for special conditions, the **Calibrator** can also recalculate its original settings to account for these conditions or to simply improve accuracy.

Who uses it

The **Calibrator** has been used by USDA Forest Service spray application experts, Federal and State cooperators, aircraft pilots, and insecticide and spray equipment manufacturers.

Where it can be found

Information on the **Calibrator** can be obtained by calling Daniel B. Twardus or Stephen C. Smith at (304) 285-1545/1558, respectively.

[1]Written by Steve Smith and Dan Twardus. Steve is a Computer Assistant and Dan is a Forest Health Monitoring Specialist with the USDA Forest Service's Forest Health Protection Staff in Morgantown, WV.

Aircraft Spray Pattern Characterization - How to[1]

Prior to spraying, every aircraft should have its spray pattern characterized for width and droplet density. This insures that areas are sprayed with the correct dose and the foliage is covered sufficiently to kill the insects.

Aircraft Swath Pattern

For the kind of low-volume applications being performed in forest spraying, the spray deposit should be as even as possible across the main part of the swath, with decreasing deposit on either side. Such a trapezoidal shape gives good overlap with adjacent swaths. It also enables a safety margin for situations where wind effects or aircraft positioning errors result in imperfect overlaps.

Aircraft Spray Characterization

When performing a swath pattern assessment, you should already have established a lane separation for the aircraft and calibrated the aircraft on the basis of that value. Before going to the airfield, make sure that you have the items listed below:

Equipment

- ***Adequate Supply of Spray Cards.***--Kromekote paper® has been used for many years and is commercially available. Ask for Mead Mark 1, 10 point cover stock. It is advisable to use spray cards that are glossy on both sides to prevent moisture from penetrating and bending the non-glossy side. A small-sized target is an effective collector of both large and small drops; therefore, 2" x 3" Kromekote® cards are recommended.

- ***Dye.***--A visible dye must be added to the spray solution.

- ***Card Boxes.***-- Slotted boxes designed for holding glass microscope slides are recommended for use to hold cards until cards are analyzed. Many spray formulations, especially those containing oils, do not readily dry, so cards must be kept separate to avoid cross contamination and smearing of the deposit.

- ***Weather Equipment.***--Weather should be constantly monitored during aircraft characterization. A list of the minimum equipment required includes: a sling psychrometer for measuring temperature and relative humidity, a wind anemometer for measuring wind speed, and a good sighting compass for determining wind direction.

- ***Radios.***--Make sure all batteries are charged, and brief the pilot on the frequency to be used.

- ***Card Stands.***--Have an adequate supply of card stands. The card stand should hold the cards at least 6 inches from the ground.

- ***Smoke bombs.***--Use 3 to 4 minute duration smoke bombs to help the pilot locate the center of the card line and judge the direction and turbulence of the wind. A smoke bomb should be before early morning sprays in order to detect inversions.

- ***Safety Equipment.***--Disposable coveralls, gloves, and goggles should be used when handling dye or pesticide.

Pre-Flight Preparation

Spray Material.--The nature of the operational spray material will determine which material should be used pattern. In cases, where an emulsifiable concentrate is mixed with water and a majority of the solution is water (e.g. Dimilin®), water may be used for the runs. However, if viscous materials (such as *Bt*),

particulate, or concentrated material whose volatilities differ markedly from water are being used, then the final tank mix should be used. Generally, it is better to work with the tank mix, unless the material is not very toxic or not in short supply.

Card line length and spacing. How wide should the cards be spaced to get an adequate measurement of the shape of the pattern?

When spraying from 50 feet above the card line, even a slight crosswind component of 2 mph will drift droplets of 100 microns a considerable distance (170 feet) and larger droplets (greater than 200 microns) up to 50 feet. Therefore, it is necessary to extend the cards well to either side of the centerline of the aircraft to make sure that all the spray deposit will be caught.

Guidelines exist for card line lengths for aircraft involved in forest spraying; line length = 10 x flying height. This formula is quite generous. For single-engine aircraft, a 400-foot line is adequate when a flying height of 50 feet is used. For multi-engined aircraft, the line should be increased to 600 or 800 feet or more if a 100-foot flying height and large multi-engine aircraft are being tested. Cards should be placed in a straight line at 5-foot intervals in order to obtain a good resolution of the pattern. A 10-foot spacing gives a coarser picture.

The orientation of the card line should be perpendicular to the wind. Getting the direction right is often not easy when trials are conducted early in the morning. As the sun rises and heats up the ground, the wind direction may veer back and forth considerably as vertical mixing in the atmosphere takes place. If temperature increases beyond 80°F, or the humidity falls below 50 percent with temperatures higher than 60°F, the spray trials should be suspended until conditions become more favorable for spraying. This is why it is so important to monitor weather conditions continuously during aircraft characterization.

Replicates.--How many times should the aircraft be tested? The question, "How adequate is the shape of the pattern, is it even or does it have problems?", can be quickly answered with single runs, changing nozzle positions as necessary between runs. When satisfied that the pattern meets requirements, make additional runs with the same configuration to build an average or typical pattern for that configuration. This is required because the passage of droplets between release and deposition is subject to complex atmospheric influences. The swath pattern obtained after one run should not be considered as sufficient to establish the true pattern. A minimum of two independent runs should be made. Putting out two or more collector lines for each pass is only worthwhile if sufficient resources are available to analyze each of the card lines. Remember that these do not constitute an independent replicate.

Spray Trial Procedures

Make sure the pilot is well briefed on what has to be done. The ground crew should continually monitor the weather while the aircraft is airborne and advise the pilot when a run is possible.

In order to obtain a true picture of a cross-sectional slice across the swath, the aircraft must be flown directly into wind. Once the wind direction is more than 40 degrees off the card line, the card line should be realigned perpendicular to the wind.

If a nontoxic product is being sprayed, position flaggers 200 feet on either side of the spray card line, in line with the wind. Smoke bombs can be helpful to indicate current wind conditions, since both ground crew and pilot can see changes in the smoke quickly.

Spray switch-on and switch-off should be done, bearing in mind the passage of small droplets due to wind drift. Flying height and wind strength directly affect the droplet distances from the centerline. Switch-on should be made 200-300 feet away from the target line when flying into

wind at 50 feet above the card line before switch-off. Switch-off should be made at 300 feet past the card line in still wind conditions, but should be extended according to the strength of the wind. As a rough guide, in 9 mph winds, the aircraft should fly about 1,000 feet past the card line. In stronger winds, should you be characterizing the aircraft?

After a spray run has been made, wait at least 5 minutes before collecting the cards. It takes this much time for the small droplet to settle out and allows the droplets time to dry on the cards.

[1]Adapted from Chapter 2 in "Aerial Spraying for Gypsy Moth Control: A Handbook of Technology". If you would like to receive a copy of this publication, please contact Amy Onken, USDA Forest Service, 180 Canfield St., Morgantown, WV, 26505 (304-285-1565).

Gypsy Moth Quarantine Area

Spread of gypsy moth occurs in two ways: naturally by windblown dispersal of the newly hatched caterpillars, and by the inadvertent transport of the insect, primarily egg masses, attached to vehicles, building materials, nursery stock, and almost any other moveable object. Since the natural dispersal of gypsy moth cannot be controlled, interstate movement of articles that may be infested with the insect are regulated by a Federal quarantine. Federal regulations prohibit the movement of certain articles from those parts of the country regulated (gray) for gypsy moth to any unregulated part (white) of the United States (see front cover map).

Articles Requiring Inspection and Certification Prior to Movement

- Nursery stock and Christmas trees
- Logs, pulpwood, and wood chips
- Mobile homes and associated equipment
- Outdoor household articles, such as outdoor furniture, barbecue grills, firewood, doghouses, boats, recreational vehicles, trailers, garbage containers, bicycles, tires, tents, awnings, garden tools, etc.

For more information, contact plant regulatory officials in your State department of agriculture or the USDA's Animal and Plant Health Inspection Service or your county extension agent for assistance regarding requirements for moving regulated articles.

The Swath Kit[1]

The Swath Kit is a combination weather station, spray deposit measuring tool, and an information storage and spray pattern modeling program. Here's what the Swath Kit has evolved into over the five or so years of field use in Canada, the U.S., and Central America.

Weather Measurements

Weather is recorded in a 10-minute time window with a measurement recorded every two seconds. Weather parameters recorded are wind speed, wind direction, temperature, and humidity. The weather data is displayed graphically showing wind speed and direction swings.

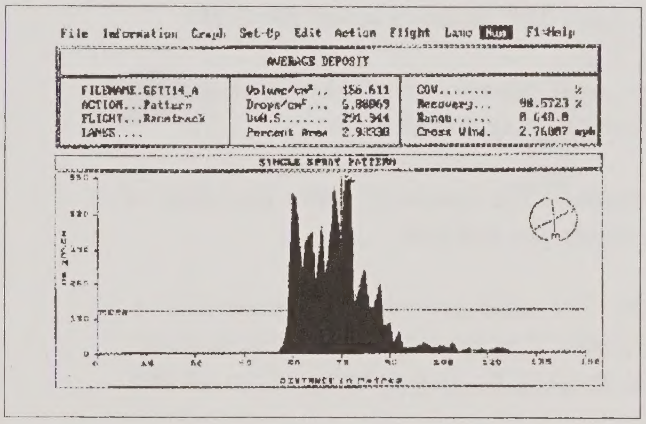
Deposit Measurement

Probably the most difficult parameter to measure is deposit, the amount of spray per unit area. The Swath Kit uses image analysis techniques where a spray card is used to capture spray droplets. Starting with the first spray card from a card line, the user holds the card in front of a video camera to make a measurement, and then the computer system makes rapid measurements on the numbers and sizes of spray deposit on the card and displays the results. The technique is quick and an aircraft's spray pattern can be measured in 15 to 30 minutes. Deposit may be presented in several different ways: volume of spray per unit area, number of droplets per unit area, percentage of the surface area covered with spray, droplet size, or all of these parameters.

Spray Pattern Analysis

The bottom line is understanding the effects of different pattern shapes and widths on the uniformity of a field deposition. The Swath Kit includes a set of software tools to help in this analysis.

First, a tool to view individual spray patterns, using one of four major parameters: mass of deposit per unit area; number of droplets per unit area; volume median diameter (drop size); and percent of spray card covered by droplets. A user can also overlap a single spray pattern and view the deposit expected from a field application. This procedure allows a display of the expected uniformity and expected average deposit across the field. Finally, since one of the most asked questions is "What happens to the field deposit if I fly a wider lane separation?", users can look at the effect of a range of lane separation on average deposit and deposit uniformity.



Technology Transfer

In July of 1990, a Swath Kit Users Group and Newsletter were created. The Newsletter keeps users current on modifications to the Swath Kit's hardware and software. Reports from various cooperators on where and how the Swath Kit is being used and a trouble shooting section are also included.

Contact Amy at 304-285-1565 if you have questions about the Swath Kit, database, or Users Group.

[1] *Written by Amy Onken. Amy is an Entomologist with the USDA Forest Service's Forest Health Protection Staff in Morgantown, WV.*

Say What? Some Common Spray Technology Terms

Aircraft wake.--The track of turbulence left by an aircraft moving through the air.

Application rate.--The total quantity of material applied per acre. It is distinguished from dose rate which is the amount of active ingredient per unit area.

Calibration.--Calculating and obtaining a desired flow rate from a spray system.

Characterization.--The evaluation of spray swath including an assessment of swath width, VMD and drop densities across the swath.

D-max.--A general method of estimating and evaluating spray droplet sizes.

Dose rate.--The amount of active ingredient of insecticide per unit area.

Drift.--The aerial movement of a material to a place other than the target. Drift results from spray droplets floating or being driven off-site.

Flow rate.--The amount of spray material that is emitted from an aircraft spray system, usually expressed in terms of gallons per minute.

Inversion.--Reversal of the normal temperature change with altitude, where temperature rises as altitude increases.

Lane separation.--The distance between successive flight patterns.

NMD.--Number median diameter. The droplet size that divides the spray in half on the basis of droplet numbers. Half of the droplet will be smaller that the NMD size, and half will be larger.

Nozzle.--Any device through which liquid is emitted, broken up into droplets, and dispersed.

Relative humidity.--The amount of water in the air expressed as a percentage of the maximum that the air could hold at a given temperature.

Rotary atomizer.--A spray unit which forms droplets using rotation. The rotating atomizers used on aircraft are usually rotating cages or rotating cylinders. They are either driven by the slipstream (Micronairs) or by electric motors (Beecomists).

Spray deposit.--Measurement of material deposited on a predetermined area (e.g., number of droplets per square centimeter).

Spread factor.--The constant to convert stain size measured on a card surface to actual droplet size causing that stain. It is conventional to express spread factor as droplet size divided by stain size. Thus, a droplet which gives a stain twice as wide as it original size has a spread factor of 0.5. However, the same relationship can also be expressed as stain size divided by droplet size, giving a spread factor of 2.

Stain analysis.--The measurement of droplet stains providing data on droplet density, droplet sizes, percentage of area covered and volume of deposit.

Swath width.--The width of the deposition of a spray swath on the ground or target. Effective swath can be considered as the portion of the total swath that receives at least the minimum dosage that will reduce the pest population.

VMD.--Volume median diameter. A measure of droplet sizes. The droplet size that divides the spray volume in half, 50 percent above the VMD and 50 percent below.

On the Internet

The Gypsy Moth News is available on the Internet. Our address is:

http://gypsy/nahome.html

This is also the Home Page for the USDA Forest Service, State and Private Forestry in the Northeastern Area. Work on Internet information is constantly being done, so don't be surprised to find us moving around.

Other sources of information about gypsy moth can be found at:

http://gypsy.fsl.wvnet.edu:80/~Sandy

This is the Home Page for gypsy moth in North America maintained by Sandy Liebhold in Morgantown, WV.

☆ U.S. GOVERNMENT PRINTING OFFICE 1995—606-277